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A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

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On October 13th.—3511 to 3524.—G. H. Jones and R. G. White. Apparatus for lighting and extinguishing gas lamps by galvanic and electro-magnetic influence.—W. Garnett. Saddles.—J. Warwick. Sewing machines. — G. Shann. Steam trap.—Sir D. L. Salomons. Electric communication between railway trains in transit or otherwise, and signals, stations, or termini, and apparatus employed therefor.—R. J. Hood. Variable exhaust apparatus for locomotive engines (com.)—A. Metcalf and W. Gibbons. Steam regulating valves (com.) (Complete specification.)—W. R. Lake. Apparatus for ascertaining and indicating the height of water in steam boilers (com.)—L. J. Knowles. Looms. (Complete specification.)—F. Chomé-Steinbach. Paving stone.—W. H. Preece, J. Radcliffe, and M. Gray. Means for communicating between passengers and the guard and engine driver of railway trains.—T. J. Martin. Apparatus for affixing labels to bottles or other curved surfaces. —W. R. Morrison. Gravitation motive power. —F. Wirth. Method of and apparatus for preparing malt (com.)

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On October 17th.—3566 to 3584.—J. Reynolds and W. Reynolds. Machine for filling or partially filling bottles and other receptacles with any kind of liquid, syrup, paste, or semi-liquid substance, and for corking, closing, or stoppering the same or any other receptacles.—G. Ashworth and E. Ashworth. Steam-pumps or pumping engines.—J. Naylor. Shirt fronts and collars, and fastenings for the same.—J. S. Farmer. Means and apparatus employed for securing the safe working of railway points and signals.—F. J. Odling. Manufacture of a composition to be used chiefly as a substitute for wood in panels and other like forms.—H. W. Nield. Machinery or apparatus for cooling and refrigerating liquids and manufacturing ice.—J. A. Guivet. Apparatus for sewing knitted fabrics.—W. R. Kinipple. Caissons and bridges to bridge across the entrances to graving docks, wet docks, harbours, rivers, or estuaries.—G. J. Drury. Boots, shoes, and other coverings for the feet, which are also applicable for rendering leather and other flexible substances impervious to water.—P. J. Luntley. Stoppers for bottles containing soda water and other such fluids, and bottles connected therewith.—J. Rostron. Machinery for winding two or more yarns or threads on spools or bobbins.—J. J. Coleman. Production of volatile liquid hydrocarbons from hydrocarbon gases, and apparatus employed therefor.—W. Kennedy. Machinery for making or forming and pressing bricks or other plastic or semi-plastic forms.—R. T. Gillibrand. Looms for weaving.—T. Fielding and J. E. Fielding. Looms for weaving.—J. Brierley. Chimney tops.—W. R. Lake. Machinery for cutting textile and other materials (com.)—H. H. Murdock. Process for quickly drying and carbonising spent tan and obtaining therefrom its essential oil, tar, and gas, and a combustible vegetable carbon, and a substance which may be used in the manufacture of impalpable black and gunpowder, and divers articles in which dried wood and ligneous and fibrous materials are usually employed (com.)—A Brandon. Shirt and other studs, solitaires, sleeve-links, earrings, and other dress fastenings and ornaments.

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On October 22nd. — 3634 to 3647. — W. E. Gedge. Method of forming subterraneous and other conduits or pipes (com.)—T. Unsworth. Flyers and arrangements for drawing yarn from the same for spinning and doubling all fibres.—S. Knowles. Apparatus for drying yarns, woven fabrics, paper and other materials.—St. C. J. Byrne. Screw steam barge or vessel more particularly adapted for towing purposes on canals or other shallow and contracted waters. —R. Low. Apparatus for condensing steam and for refrigerating.—P. L. Manbre. Process and apparatus for the conversion of starch and fecula into gums compounds of gum and glucose, glucose, caramelized glucose, and other analogous products.—W. Brown. Machinery for rolling rails, girders, bars, and plates, or sheets of iron and steel and other metals.—R. R. Horne. Refractory or fire resisting material which may be used for the construction of retorts and other articles having to resist the action of heat, the same being applicable as a hydraulic cement.—T. Appleby. Method of and apparatus for cutting up and for trimming the ends of oil and other cakes of compressed seeds.—W. Stableford. Additions to catch hooks and links for coupling railway vehicles.—G. Haseltine. Construction of weavers or warpers' spools (com.) (Complete specification.)—J. Hönck. Process of treating fish to prepare it for eating.—E. Squire and J. McComb. Machinery in which revolving cutters are employed.—G. O. Talbot. Safe locks.

(*Continued on page* 13).

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ARTS, INDUSTRY, AND MANUFACTURES,
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JANUARY 1, 1875.

INVENTORS' INSTITUTE.—OPENING DINNER, SESSION 1874—75.

At the present crisis we think it not out of place to give a prominent position to the following:—

The annual dinner of the members and friends of the Inventors' Institute—a brief notice of which appeared in last month's Scientific and Literary Review—took place at St. James's Hall, London, on Thursday, November 26. There was a large attendance, and the proceedings throughout were of a most satisfactory character. Amongst those present were Sir Antonio Brady (the president of the Council), who occupied the chair, Major Beaumont, M.P., Captain Selwyn, R.N., Captain Greenfield, R.A., Dr. R. H. Collyer, Dr. J. McGregor Croft, Messrs. F. Ransome, H. Cross, Hume Williams, C. G. Carttar, T. Morgan, F. H. Varley, T. Paterson, M. M. Harris (treasurer), F. W. Campin (secretary), Broadhurst, Savage, A. J. Murray, Jerome, and several gentlemen from America.

After dinner, which was served in a manner highly creditable to the manager of this well-known restaurant,

The Chairman gave the usual loyal and patriotic toasts, and they were responded to very enthusiastically. In connection with the toast of "The Queen," Sir Antonio said that we lived in no common days, and that we had the good fortune to belong to a nation blessed beyond all nations of the earth. He had heard this toast given recently in the United States of America with such an amount of enthusiasm as really did his heart good. He believed that in no part of the world was her Majesty's name more honoured than by our American cousins on the other side of the Atlantic. He was glad to be able to say that they had among them that evening many distinguished Americans. (Cheers.) In introducing the other preliminary toasts, Sir Antonio thanked God that we had a House of Lords. He regretted that there was no member of that august body present. They had, however, among them a distinguished member of the Lower House, and he knew that many more of them would have been present only that they were not in town. He had, therefore, to ask Major Beaumont to do the double duty of responding for the two Houses of Parliament. The Duke of Manchester and the Earl of Caithness, who were Vice-Presidents of the Institute, would, he understood, have been present, but that they were prevented by other engagements.

Major Beaumont, M.P., who on rising was greeted with much enthusiasm, said he ventured to think that the principal interest the members of the Institute would feel in the toast would depend on the amount of importance which the two Houses of Parliament would attach to industrial pursuits, and to the extent of protection they would be disposed to give to the development of these pursuits. (Hear, hear, and cheers.) He was sorry to have to say that two of the most eminent members of the House of Peers—namely, the Earl of Derby and Earl Granville—were opposed to the object which the Institute had in view. He confessed that he was astonished that this should be the case, and he hoped that further inquiry and discussion would induce those distinguished statesmen to change their opinions on the subject. With regard to the House of Commons the interest its members took in the question of industry was well known. He thought he might say there was a strong feeling in the House of Commons that a change in the Patent Laws was advisable, and indeed necessary. It seemed to him then, that there was comparatively little difficulty in effecting the change which this Institute desired in the Patent Laws. His view of the matter was that the head and front of the error in the existing Patent Laws was that persons could obtain a patent for a thing whether it was of any value or not. The first principle which should be acted upon was the cheap and easy protection of genuinely good inventions. (Hear, hear, and cheers.) It appeared to him that without adopting all the American system the best plan was to refer all new inventions for which patents were desired to a properly constituted and properly recognised and independent tribunal. (Hear, hear.) Such a tribunal should, however, be entirely above suspicion, so as to inspire the inventor with confidence that he would be done full justice to. As a member of the Committee of the House of Commons which sat on the subject, he had listened to the great bulk of evidence which was brought forward, and he did not think that they had made out a case against the utility of patents. At the same time, he thought that the position of the poor inventor was not brought into sufficient prominence before the Committee. (Hear.) He ventured to think, however, that no judgment would be given on the subject by the House of Commons that was not entirely impartial, and he only hoped that the House of Commons would be induced to take the matter in hand at once. He was glad to have heard that day that the Lord Chancellor had stated his intention to take the subject up. (Cheers.)

Captain Greenfield, R.A., responded for the Army, Captain Selwyn, R.N., for the Navy, and Mr. H. Cross for the Reserve Forces. Captain Greenfield remarked that the soldier owed much to the inventor, for as a combatant he was indebted to him for improved weapons of warfare, whilst his sanitary condition was benefited by inventive skill. (Applause.)

Captain Selwyn said the Navy was without doubt deeply interested in the progress of invention, and he was free to admit that much had been done by inventors, and much more promised by them; but he could not speak on this subject with unmixed satisfaction, for some of our recent inventions seeemd to threaten to improve the Navy out of existence altogether. He, nevertheless, looked forward to the future with hope, as to a time when real invention would be fostered by the Government—(cheers)—and naval science, associated with naval heroism, should place our Navy in even a prouder position than ever. (Cheers.) He thanked them much for the hearty manner in which they had drank this toast, and the way in which they had coupled his name with it, but he could not help thinking this was owing even more to his long connection with work of the Inventors' Institute than to his position in her Majesty's Navy. (Much applause.)

The Chairman, in giving the toast of the evening, said that they had now come to the real business of the occasion. They had had abundant testimony as to the great value of the result of the study and the labours of inventors. There was no doubt that the Army and Navy of Great Britain owed a deep debt of gratitude to the inventors of England. (Hear, hear.) After remarking upon the great revolution in warfare which had been effected by means of our inventors, and the immense services they have rendered the country, Sir Antonio trusted that one of the results of those services would be that warfare would become so dangerous and cruel, that a nation would consider twice before entering upon one. They were assembled that evening to celebrate the advance of the Institute, and to the honour of those great national events which were mainly due to the inventive genius of the country. (Cheers.) They had small sympathy with those great men who wished to monopolize all patents by leaving it to Government to reward inventors or not at its pleasure. This was not an Englishman's notion. (Hear, hear.) He ventured as president of this Institution to claim for brain power a legal acknowledgment of its labours. (Cheers.) He had yet to learn that a novelist should have a patent right for what he produced, and the mechanical inventor should not. He quite agreed that if patents were guaranteed by law as a rule, great care should be exercised as to what patents should be so protected. One of the greatest objects of this Institute was to see that genuine patents should be as cheaply guaranteed as possible. They did not want the Government to be at any loss. What they contended and wished for was, that patent fees should give a sure protection. If that were to be the law for the future, patent rights would be something tangible. The existing law was not satisfactory in its administration, or in its guaranteeing effects, and they wished to do what they could to establish in this country a somewhat similar system to that which exists in the great American Continent. (Hear, hear.) They had heard of late a great deal about technical education. What grander institution for technical education could be estabhed than a good Patent Museum, furthering the studies which the Inventors' Institute wished to forward? He had hopes that the Lord Chancellor would be struck with the facts which the deputation would bring before him, and would be induced to take action in the matter. The movement was backed up by working men and the trades councils of the country, who valued technical education. He felt that it would be a snare, if after inducing working men to develope their inventive genius the products of their studies and time could not be secured to them. (Hear, hear.) His conviction was that if England was to continue to hold her own in the world, she must give her artizans as good an education as the artizans of other countries enjoy, and must give greater encouragement to the inventive genius of her sons. (Hear, hear.) He had no fear for the Anglo-Saxon race, provided they were allowed fair play. He hoped the day was not far distant when the Inventors' Institute would become a national establishment, and that it would be able to make its voice heard throughout the land. (Cheers) He had much pleasure in giving prosperity to the Inventors' Institute.

The toast was drank with much enthusiasm.

Mr. Hume Williams, Vice-President of the Council of the Institute, acknowledged the toast. He did so with the full conviction that the Institute had already earned for itself the well-deserved approval and support of every inventor in the kingdom. (Hear, hear.) The pleasure he felt in having to return thanks for the Inventors' Institute was not unmixed with some melancholy reflections. He could not avoid remembering that during the twelve years which the Institute had existed, many great and honoured names had passed away, and when he looked round the table he could not help noticing that, with the exception of his old friends, Captain Selwyn and Dr. Collyer, and his most intimate friend Mr. Campin, he saw no one present who had fought the great battle of the inventor's cause from the beginning. He contended that on the encouragement given to the development of the inventive mind of England depended to a very large and important extent, the continued prestige abroad and prosperity at home of this country, and that therefore the Inventors' Institute was entitled to the best sympathy and support of both the Government and the public. If we were not able to produce with the greatest rapidity and cheapness the different articles of every manufacture, we could not continue to maintain our position. This could only be done by encouraging the skill of our inventors, and the development of their original thought, by the production of improved machinery, and by cheap and effectual protection for the products of the brains of our inventors. (Cheers). This was what the Inventors' Institute was endeavouring to do, and it was for this reason that he called upon all present to support the Institute. and to maintain the principles upon which it was based. (Cheers). If the Institute had not been such as this, it would never have numbered among its members men who had also passed away, but whose names were celebrated throughout the world wherever science was known. The Institute had from the beginning acted in the interest of skilled labour, not with the view to cause any antagonism with the capitalist on the one hand, or with industry on the other, but with the intention of securing to the skilled workman the benefit of his achievements, and to confer a commensurate advantage on the whole community. The Institute aimed at doing nothing more than to give the skilled workman and the inventor protection for their inventions, so that they should not labour in vain. (Cheers).

Mr. F. H. Varley, Vice-President of the Council of the Institute, also responded, and in doing so took occasion to remark that having for several years past been one of the actual working officers of the Institute, he could truly say that no society similarly circumstanced had done so much as the Inventors' Institute, which had successfully stemned the tide of anti-patent law opinion, and was now actively engaged in endeavouring to procure from the Government and Legislature a thorough reform in the Patent Laws.

The Chairman next proposed "Foreign Inventors," many of whom were present.

Mr. Jerome and Dr. Collyer responded.

Mr. Paterson gave "The Council and Officers of the Institute." He fully agreed with all that had been said as to the importance to England of such an organisation as this, if she desired to retain the position she had so long occupied in the world. He ventured to prophecy that the Institute would go on increasing in importance till it assumed a very high position indeed.

Mr. M. M. Harris, treasurer of the Institute, in responding, regretted to notice that there had been heretofore a great want of unity among inventors. This should cease to be when such an organisation as the Inventors' Institute existed, which was ready to advise and assist them; and with which were connected some of the first inventors and scientific men of the day. As an inventor and a member of the Institute, he thought that the time had come when some change should be made in the Patent Laws. (Hear, hear.) What was required was a reduction in the cost of a patent, and a legal value given to a patent when it was obtained. So much did he value the services of the Institute that he should be always willing to serve it in any way that was in his power —(cheers)—and as treasurer he would ask all to give it pecuniary aid as well as moral support.

Mr. F. W. Campin, secretary of the Institute, begged to thank them very much for the kind way in which they had received his name as connected with this toast. The Council and officers had done all they could on behalf of inventors, and though they had obtained much success, still they found that many obstacles were put in their way which they could hardly have expected to have had to encounter. And as they had a distinguished member of the House of Commons and its Patent Law Committee present, he would mention that he considered that committee a complete "botch," for the evidence taken did not fairly embrace that of the Inventors' Institute, though it had nominated two gentlemen as fit to give evidence on its behalf, and they had offered their evidence. But the chairman of that committee called him before it, and when he came to be examined he found that neither his knowledge as a barrister and professional connection with patent business, and the promotion of its reform, or his special knowledge as representative of the Institute were wanted, for on offering them to the notice of the committee he was stopped by the chairman, who said, "We only want to hear the opinions of the working men" —a matter that he could not so well speak about as Mr. Paterson or Mr. Savage could have done, whose evidence was he believed tendered to the committee. He did not, however, wish to disparage any of the institutions of his country, and he would say that although he thought so lightly of the Committee of the House of Commons, still, when he found in that House men like Major Beaumont, who were only anxious to act fairly and honestly, and to frame our laws in accordance with the dictates of honour and honesty as conducing to public welfare, he had every confidence in the prospective results. With these few remarks he again repeated his warmest thanks for their kind acknowledgment of his services. (Applause.)

The Chairman next gave "The Visitors," coupling with the toast Mr. Paterson, Mr. Savage, and Mr. Broadhurst, who responded in able and interesting speeches, in the course of which they urged in very convincing terms the justice and the importance of the skilled workmen of these countries having a cheap and sure means of securing the advantage of the products of their brains. They were firmly convinced that otherwise England would never be able to continue to compete with other countries. (Hear, hear.) They recommended to the Institute unity and energy of action, otherwise the Government would pay no attention to them. (Hear, hear.)

Dr. Collyer, as an inventor of thirty years' standing, remarked upon the difficulties and the injustice of the existing Patent Laws, and gave it as his fixed opinion that the House of Commons is perfectly incompetent to legislate for inventors.

Mr. A. J. Murray gave "The Sub-Committee who managed the Dinner," to which Mr. C. Graham Carttar responded.

Dr. McGreggr Croft proposed "The Chairman," amid much enthusiasm.

Mr. Campin begged to be allowed to testify to the readiness which Sir Antonio Brady had at all times displayed to serve the Institute.

The toast having been honoured most cordially,

Sir Antonio Brady briefly acknowledged the toast. He took a great interest in the Institute. He thought that there was a great future before it. It now numbered nearly 600 members, among whom were many distinguished philosophers and inventors of the present age, including Siemens, Bessemer, and several well-known persons he could name. He quite agreed with the working men who had spoken, that without unity of action and a concerted display of energy they could not expect the Government to be very ready to take the subject into hand. (Hear, hear.)

Coote and Tinney's band was in attendance, and performed during dinner, and in the intervals between the speeches.

A remarkable result has been obtained at the works of Brown & Co., Sheffield. A revolving disc, made from a railway saw, with all its teeth cut off, was mounted on a spindle and driven at nearly 3,000 revolutions a minute; this was,—the disc being three feet in diameter,—a circumferential velocity of over five miles a minute. Steel rails forced against this disc were most rapiely cut through, appearing to melt before the revolving disc, giving off an abundance of sparks, while after cutting five rails it was itself not sensibly warm.

Mr. T. W. Danby, of Downing College, Cambridge, is preparing a translation of the "Practical Guide to the Determination of Minerals by the Blowpipe," of Prof. C. W. Fuchs, of Heidelberg.

Reviews.

FRASER AND DEWAR ON CREATION.

"The Origin of Creation: or, the Science of Matter and Force." A New System of Natural Philosophy. By THOMAS RODERICK FRASER, M.D., and ANDREW DEWAR. London: Longmans, Green, Reader, and Dyer. 1874.

THIS work is not simply one of those scientific polemic treatises that we may now expect to see daily issuing from the press, owing to Professor Tyndall having set the ball rolling by his Belfast address; but it is an exposition of an altogether peculiar system of Natural Philosophy; and we are bound to say that whatever view the reader may be inclined to take as to the soundness of the theories propounded, its authors have produced a very able and interesting exposition of their peculiar views. By referring to the preface of the book, it will be found that its authors present themselves as advocates of a vast undertaking, which is, as they expect, to revolutionise the whole theory of Natural Science taught and believed in at the present day, and to inaugurate a new system, based upon a natural law, the evidences of which they affirm they have discovered, and consider to be of necessity universal, and therefore capable of explaining all natural phenomena.

This system is (as they say) not the development of a day, but has been in progress, in various ways, for many years, more particularly since the hidden meaning of Magnetism was discovered and applied by the authors.

The nucleus of the present work appeared some time ago in a weekly periodical, in the form of Essays on Natural Science; and the reception given them, along with the importance and admitted necessity for such a work, have induced them to issue the present volume.

The data upon which these theories have been built have, in all the subjects touched upon, been based on personal observations in chemistry, telegraphy, and marine diving; in an extensive experience in coal and gold mines; also with travelling in the Gulf Stream, the Calms of the Equator, the coasts of Brazil, California, and Mexico, the Mediterranean, the Bay of Fundy, the Hot Sulphur Baths of Salt Lake, the Great Geysers of California, and the mangroves of the Isthmus of Panama.

The main intent of this singular work seems to be to give a flat contradiction to nearly every received opinion on scientific questions, and in proof of this statement we present our readers with the chapter on "Matter and its Force."

Having in the preceding chapter stated what the two great classes of matter are, we now proceed to speak of the force which governs them in all their movements and products, and to which we have given the name of "Atomagnetism."

It is this law which Professor Huxley, as shown in the following quotation, has been striving after without success. In an article on Bishop Berkeley's works in *Macmillan's Magazine* 1871, he says:—"There is a passage in the preface to the first edition of the "Principia," which shows that Newton was penetrated as completely as Descartes, with the belief that all the phenomena of nature are expressible in terms of matter and motion. It is this, 'Many circumstances lead me to suspect, that all those phenomena may depend upon certain forces, in virtue of which the particles of bodies, by causes not yet known, are either mutually impelled against one another and cohere into regular figures, or repel or recede from one another; which forces being unknown, philosophers have as yet explored nature in vain.'"

A great deal has been said lately about matter and motion, but the latter is as yet only known to the most daring speculators as a senseless dance of the atoms; a dance so omnipresent and never ending, that they imagine it never had a beginning, and is as likely never to have an end. On shifting sand like this, the accepted theory of physics is based, its advocates forgetting that it is quite contrary to the working of any law of nature with which we are acquainted.

We have said all matter is formed of atoms. But every atom is also, we say, a magnet having polarity. That is, each atom has two poles similar to a compass needle, which may be designated north and south.

The law of atoms is observed to be, that like attracts like; but by the law of magnets, it is seen that like poles repel, while unlike poles attract. Atomagnetism then is the combination of these natural laws, resulting in a universal law of attraction of like atoms and repulsion of like poles. In order to make this principle clear, we will give a few illustrations.

A tree, for instance, in growing does not attract sand, and clay, and metal, and form a branch of clay or another of metal, but it attracts only material similar to itself. If a smith in casting a bar of iron tried to combine clay or coal ashes with it, he could not succeed, or else there would be no strength in the bar. Again, we cannot attract the poles of a magnetic compass with a wooden stick, or a piece of coal, or indeed anything not in the nature of iron or steel. This is the attraction of like atoms.

Now, in order to explain the repulsion of like poles, suppose we have two bars of magnetized iron, and some iron filings. If we take the ends pointing north, or the ends which attract the north point of a compass needle, and dip them into the filings, these particles will stick to the bars, and bristle out on both ends like hairs. Suppose we then bring the same ends together, the filings seem possessed of life and fall back from each other, thus showing the repulsive power of similar poles. But if we place filings on the north end of one, and on the south end of the other, the particles stretch out from each bar and cling to one another. This is a simple experiment, but very important and suggestive, and it may be performed by any one.

While thus all atoms are magnets having polarity, when a number of them coalesce or join together, each individual atom merges its polarity into the force or polarity of the whole. For instance, a small piece of iron has a north and south polarity, because it attracts the points of a compass needle; but suppose we take some hundreds of these small pieces, and form them into a large bar of iron, we do not find some hundreds of north and south poles in it, but only one north and one south pole. The force which was in each small piece is concentrated into the whole, so that the attractive and repulsive power of the bar is stronger by every piece that is added to it.

While then it may be believed, by our readers generally, that some atoms are magnets, as iron for instance, it will be hard to convince many that all atoms are magnets—for instance, the atoms of the paper we write on, or the bread we eat; but it shall be our endeavour to prove them to be so in succeeding chapters. It will be hard also to convince the world that besides being magnets, all atoms are governed by the universal law which we have advanced; but not till the last chapter is finished will we consider that we have proved our assertions, for should one effect or phenomena of nature arise which cannot be explained by it, then we throw the whole theory aside as utterly worthless.

To all this, which is remarkable enough, is added in the next chapter the following statements:—

Mineral life is indeed the lowest form of life. It is not so complicated as either vegetable or animal life, yet it is governed by the same law. The experiment of the iron filings shows that they are possessed of life. A low form of life it is indeed, yet one that infallibly directs them when to attract, and when to repel. The compass needle has similar life, and man, although possessed of the highest form of life on this earth, has to depend upon its guidance, and to stake his life upon its warnings.

But there are other forms of mineral life. We all know or have seen the philosopher's tree. A piece of zinc is suspended in a solution of sugar of lead, and in a short time the atoms of lead will be seen deposited on the zinc; which will then appear to shoot out branches and leaves in the form of a tree. If these particles of metal are not possessed of a certain principle of life activity, what leads them to arrange themselves in such a beautiful manner.

Mineral life is only one form of atomagnetism or medium by which atomagnetism displays itself; and it shows that all these various substances, the particles of lead, the coral, the sugar, and the snow, are all magnets. For instance, in the philosopher's tree, the piece of zinc first obeys the atomic law, and draws all the small atoms of lead in the solution to itself—as the greater body always influences the less. But being a magnet also, it has polarity, and as particle after particle is added to it, its force is continually becoming stronger, so that it shoots out branches and leaves as though possessed of vegetable life.

While, however, minerals have life, it is not a form of existence fitted to produce seed, but in other respects it resembles vegetable and animal life, inasmuch as it reproduces its kind from suitable material.

Perhaps the key-note of the scientific system taught by this work is to be found in the following quotation:—

Following up our chapters on light, we come to electricity. In fact it ought to form part of the chapter on Light, for all light is electricity. The greatest scientific delusion of the day is the supposition that electricity has anything whatever to do with telegraphing, except, that under certain necessary conditions, the magnetic force in the wires ofttimes exhibits it.

Magnetism and electricity are essentially two different things, but they have been so interchanged by writers for several generations, that the public mind is uncertain where the boundary line lies. We hope, however, by a few facts and illustrations, to be able to show clearly what each phenomenon is, and the difference between them.

In the first place, to show how little is really known about either, we will quote a few paragraphs from well-known writers on the subject.

Dr. Thomas Thomson, in his treatise on "Heat and Electricity," says:—"Electricity is the property acquired by bodies, of attracting and repelling light bodies, through the action of friction on them." This is exactly the property possessed by a magnet. Why then should two names be given to the same thing?

In another chapter the same writer says:—"I shall now give an account of the recently discovered facts, which have shown the dependency of magnetism on electricity." Then follow a number of statements which, in our view, would show the reverse, for the names are merely transposed. Notwithstanding all he says in his treatise regarding electricity, he has at last to confess, in speaking of the powers of attraction and expulsion:—"We are altogether ignorant of the cause of these properties."

"In Parker's "School Book of Philosophy," we read:—"Electricity is the name given to an imponderable agent which pervades the material world, and which is visible only in its effects." Again, he has also to confess:—"The nature of electricity is unknown."

Sir Wm. Thomson in "Good Words," 1867, says:—"In every kind of electric telegraph, long or short, ærial or submarine, a signal is sent from either end, by causing electricity to flow through an isolated metal wire." A very rapid and singular kind of flowing it must be; for he tells us that it travels at the rate of, "twelve times around the globe in a second." He has also to confess his want of knowledge on the subject, for he says :—"It may be regarded as probable that there is a real electric fluid, and that this fluid really flows through the wire; but in the present state of electric science, we cannot tell, or even conjecture on any ground of probability, whether the true positive electricity is that which is commonly so-called, or," &c.

Prof. Tyndall also says in his lectures on "Heat" :—"We have every reason to conclude that heat and electricity are both modes of motion; we know experimentally that from electricity we can get heat, and from heat that we can get electricity. But although we have, or think we have, tolerably clear ideas of the character of the motion of heat, our ideas are very unclear as to the precise nature of the change which this motion must undergo, in order to appear as electricity; in fact we know as yet nothing about it."

Prof. Grove says :—"How the phenomena are produced to which the term attraction is applied, is still a mystery."

In Prescott's "History of the Electric Telegraph"—which is a compilation of facts from De la Rive—we read :—"The theory most generally admitted is that there are two electricities, each composed of particles that mutually repel each other." What would be the use of two electricities, having the same properties; in fact we cannot see how there could be two, if they had the same force. Moreover, two differing electricities could reciprocate, while two similar ones could not. We do not see either how a message could be sent along the wires, if the particles mutually repelled each other. If, on the contrary, they mutually attracted and repelled, there might be some sense in it.

From the quotations given, it will be seen how little is really known about either electricity or magnetism, and it is no wonder, seeing the manner in which they have been mixed up, that no one has been found capable of separating them. This, however, we shall now endeavour to do.

And after some illustrative statements, the authors add :—

> Magnetism, therefore, and not electricity, is the great "imponderable agent" which governs and controls all the movements of the material work. Instead of magnetism being dependent upon electricity, the case is reversed, as will be shown in the next chapter, and all forms of "light" whatever are consequently caused by magnetism under certain conditions.

Many other curious propositions, including a new theory of Medicine, are propounded, but our space calls on us to forbear further quotation, although, perhaps, the religious aspect of these peculiar views demand some attention; but as to this, we will quote the following :—

> While we deny that our system favours the materialist or the infidel, we maintain that it brings the most conclusive evidence to bear against them. The existence of the Great God, the Designer and Ruler of all, is thus seen at once to be true, for in the perfection of the law is shown the perfection of Him who created it.

BROADBENT AND CAMPIN'S EARTHWORK TABLES.

"Earthwork Tables," showing the Contents in Cubic Yards of Embankments, Cuttings, &c., of Heights or Depths up to an Average of 80 feet. By JOSEPH BROADBENT and FRANCIS CAMPIN, Civil Engineers. London: Lockwood and Co. 1874.

THIS is a very useful book of tables, prepared, it is stated, by the authors (in the first instance for their own use) in order to facilitate the accurate determination of earthwork quantities in estimates for permanent work.

The heights of embankment or depths of excavation are given in feet, progressing by increments of one-tenth of a foot; the contents corresponding to these heights are in cubic yards, each quantity showing the amount contained in a length of work of 100 feet.

The importance of observing accuracy in the measurement of heights, and determination of quantities therefrom, is most obvious in cases where they are comparatively small: thus, in the case of cuttings of about 7 feet deep, if we have no intermediate heights between 7 and 8 feet, an error of between 8 and 9 per cent. must occur—a matter of no small importance in a considerable length of such work.

A detailed review of this work is almost impossible; we recommend those of our readers who have to do with earthworks to procure a copy, and judge for themselves.

PROCTOR'S TRANSITS OF VENUS.

"Transits of Venus." A popular account of past and coming transits. From the first observed by Horrocks, A.D. 1639 to the transit of A.D. 2012. By RICHARD A. PROCTOR, B.A. (Camb.) London: Longman, Green, and Co. 1874.

THIS work, from the prolific pen of Mr. Proctor, is written in his truly excellent style, and, as stated by its title, is a popular account of those great events, the Transits of Venus, past and coming, the most recent of which, that on Dec. 8th last, having been as far as yet ascertained very successful, will doubtless be the means of setting at rest the great problem the solution whereof has been so anxiously sought after, the more so as the opportunities for solution are so far apart.

The book opens with a graphic description of the transits that occurred in the seventeenth century, and the results that were attained by the imperfect means then at disposal. The description of the transit of 1631 by Gassendi, at Paris, is very instructive, showing how a true lover of science can overcome, by his own energy, the difficulties that beset his path. Following in the footsteps of Gassendi come the exertions of our own countryman, Horrocks, who, profiting by the means devised by Gassendi, succeeded, under great difficulties, in witnessing the transit, and his description of the phenomena, as given in this work, is very interesting.

Between the transit of 1639 and the next one in 1761 a long interval intervenes, in which Halley lived, who devised a method of determining the distance of the sun from the earth, which method, in preference to that of Delisle, has been so keenly advocated with regard to the transit of Venus which occurred on the 8th of Dec. last. Halley computed the transit of 1761, which, however, was, by the results, proved incorrect, although he lived not to know this.

In the third chapter is a description of the transit of 1769, as seen from various parts of the globe, the description specially interesting being that of Captain Cook of the transit as observed by him at Otaheite in the South Seas. In this and the previous chapter are described the misfortunes attending Le Gentil, a French astronomer, whose devotion to the science deserved better results, for although he in 1761 traversed a large portion of the globe, yet after enduring all the weariness, all the privations, and all the perils of a long sea voyage, he effected nothing; and that was not all: he experienced the culmination of his misfortunes in 1769, for we are told that "with a persistent courage worthy of better success, he determined, after his failure in 1761, to return to Pondicherry as soon as an opportunity presented itself, and there to await, during eight years, the transit of 1769," but "on June 3rd, at the moment when this indefatigable observer was preparing to observe the transit, a vexatious cloud covered the sun, and caused the unhappy Le Gentil to lose the fruits of his patience and his efforts."

Chapter IV. very graphically describes the various methods devised for the determination of the sun's distance by observation of Venus. Our space does not permit of our giving an account of these methods, but Halley's method, called by the author "Method of Durations," a name descriptive of the qualities of the method, as this method requires the whole transit to be seen, or, at least, the beginning and end. Then follows the description of Delisle's method, which, unlike Halley's, does not depend on method of duration, but that at suitable stations a single observation of a contact, whether at ingress or egress, supplies the means of determining the sun's parallax. The remainder of Chapter IV. is devoted to the consideration of how successive conjunctions of Venus are brought about. Chapter V. describes the coming transits, and of course includes a description of the means to be adopted in observing the transit that has recently taken place. The author has also enumerated the various stations for viewing the transit of 1874, and their advantages or disadvantages, according to his views, and then follows a comparison between the methods of Halley and Delisle, for viewing the transit of 1882 as also that of 1874; but as regards this portion of the work, we must refer our readers to the book itself, which will amply repay perusal and study by not only the strictly scientific reader, but also by those who take an interest in the subject, though not well acquainted with the science of astronomy. The work abounds with illustrations, and its general character leaves nothing to be desired.

PULVERMACHER ON GALVANIC ELECTRICITY.

"Galvanic Electricity; its Pre-eminent Power and Effects made Plain and Useful." By J. L. PULVERMACHER, 194, Regent-street.

MANY of our readers, to whom the name of the author of this little treatise has become familiar through an extensive system of advertising, may not be equally well acquainted with it as that of an earnest and laborious, as well as successful, inventor. To the uninitiated, it might appear but a small matter to have invented and perfected a voltaic battery requiring no vessels to contain the "exciting fluid" and depolarising oxidant, charged in a few seconds, flexible and portable, and withal, sufficiently powerful for two or three of its "links" to effect the transmission of telegrams through an Atlantic cable. But this in truth represents the labour of a lifetime. *Quasi* inventions, purporting to be of the same character, have, at frequent intervals, appeared as competitors with this chain-battery; but have disappeared and left no record, for the simple reason that, on examination, there was nothing whatever electrical in them, except the name. And it is an unfortunate consequence of the fact embodied in the apothegm that "what is everybody's business is nobody's" that the unscientific section of the public—that is, the great majority of high and low—would, in this country at least, have been left altogether without protection against the false pretences under which these inert contrivances were put forward if it had not happened that it was the interest of a genuine inventor to oppose and expose them. Otherwise, although every tyro in electricity could perceive at a glance that these arrangements were—in some cases almost ingeniously contrived—so that any electric current could not by any possibility be generated by them, they would have afforded a large field for *exploitation*, at the expense of the public, and to the great detriment of any real scientific application in the same direction.

One of the objects of the present publication appears to be an *exposé* of the utterly negative character of certain appliances now put forward and largely advertised as curatives. It is one of the signs of the failure, up to the present time, of the attempts to adequately popularize science that such an *exposé* should be necessary. Medical electricity has now an extensive scientific literature of its own, and disciples of very high medical reputation in all parts of the world; and the value to it of the chain batteries, which have been referred to, has been fully recognised by such men as Golding Bird, Locock, Fergusson, Ranald Martin, &c., as well as by scientific bodies, such as the *Académie de Médecine*. In regard, however, to the direct application of *magnets* to the human frame, there is no proof extant either of its efficacy or of any perceptible physiological effect resulting from it. But even if we suppose the existence of such efficacy or effect in the case of powerful magnetic appliances, it would require, one might think, an almost impossible stretch of credulity to attribute these to a few pieces of magnetized crinoline steel sewn up in flannel, or to magnetized steel filings disseminated in india-rubber, and worn in greater or less proximity to the skin. Yet such, it seems, are the appliances, the competition of which our inventor has to oppose. His mode of opposition, as will be seen from the following quotation, is both ingenious and amusing; a really useful little contrivance is thus brought, in counter competition, to the notice of believers in the curative virtues of minute magnets :—

"If a *bonâ fide* magnetic appliance could be found of any real curative powers, no one would be more ready to give it a fair trial than I. My patent safety pin fastener, when made of magnetized steel, being a most convenient means of application, is at the disposal of anyone who would try it fairly and report faithfully on the result." . . . "As far as the injury to the purchaser's pocket goes, we may be amused at the cleverness by which he is persuaded to make an outlay; but there is a more serious side of the question, viz., the disappointed hopes which are felt by the sufferers, who, only partially understanding, but wholly believing the advertisements, don the magic garments in the expectation that all their pains and aches will disappear, believing that they are about to try medical electricity in an improved form, and are thus diverted from trying the *bonâ fide* portable electrical appliances in existence, the invention and perfection of which have cost me a lifetime of study and labour."

The author has not, however, exclusively confined himself to the medical applications of electricity, one of his aims being to popularize a knowledge of the more elementary and general facts of the science. The history of electricity is in the first place glanced at, and the initiatory experiments with a glass tube or stick of sealing-wax, and a suspended feather or pith ball are described. Insulation and conduction next receive attention, the nature of the observed difference between frictional and voltaic electricity is pointed out, the "contact" and "chemical" theories of voltaic action are referred to, and the principal phenomena of the voltaic circuit are illustrated by experiments with the chain battery. The construction of the galvanometer and the production of magneto-electric currents are popularly explained; and the physiological effects of electricity—being the subject with which the author is mainly concerned—are entered into at some length. Lastly, in a kind of appendix, the "magnetic" appliances to which we have referred are dealt with as we think they deserve. Spread wholesale, as it is intended to be, amongst the non-scientific portion of the community, this little publication, by a recognised inventor, will probably do as much for what has been termed the *lateral* extension of knowledge, as more pretentious works have done for the *vertical* extension of the same class of facts.

BRINKLEY'S ASTRONOMY.

"Brinkley's Astronomy." Revised and partly re-written with additional chapters. By John William Stubb, D.D., and Francis Brunnow, Ph.D. Second edition, enlarged and improved. London: Longman, Green, and Co. 1874.

We have heard within the last few weeks much about astronomy, especially in regard to the transit of Venus, and the terms and phrases may, and, in a great many cases do, mystify the non-astronomic reader, who cannot conceive how that by the (to him) simple thing of a planet crossing the sun's disc we are enabled to measure the distance that our earth is from the sun. Yet so it is, and the uninitiated in the science who may desire to know how this is brought about should have recourse to astronomical works Therefore the work under notice calls for careful perusal, not only by those really ignorant of astronomy, but also by students, to whom it seems to be specially adapted. It is a book not much known to students in England, though in Ireland it seems to have been a standard work for the student for a long period; and this edition is rendered necessary so as to bring the work up to the present state of the science. It is written in a very lucid and familiar style, which will be thoroughly understood by students of ordinary attainments, and we cordially recommend it to those interested in the study and furtherance of the grand science of which it treats.

REVIEWS POSTPONED.

"An Elementary Exposition of the Doctrine of Energy," by D. D. Heath, M.A. (Longman).

"The Aerial World," by Dr. G. Hartwig (Longman).

"Elementary Dynamics," by W. G. Wilson, M.A. (Thacker and Co., Calcutta).

"On the Origin of Civilization and Primitive Condition of Man," by Sir John Lubbock, Bart., F.R.S.

"The Draughtsman's Handbook," by G. G. André, C.E. (Spon).

"Stones from the Quarry," Poetry (Messrs. Provost).

"Handy School Dictionary," by the Rev. J. Stormouth (Messrs. Blackwood and Co.)

"The Safe Use of Steam" (Messrs. Lockwood).

LITERARY ANNOUNCEMENTS.

The Last Journals of David Livingstone, edited by the Rev. H. Waller, with map and illustrations, 2 vols., published by Mr. Murray, is one of the most interesting books issued this season. By it we are made to become companions of the worthy and enterprising Livingstone, following him through weary wanderings and vicissitudes even to his death, and obtaining the full benefit of the knowledge of his discoveries.

The Life of His Royal Highness the Prince Consort, by Theodore Martin (Smith, Elder, and Co.), is, for all those (not a few in number) who delight in scraping acquaintance with princes and high aristocrats, the book of the hour. It is, however, something of a far higher literary character than a mere chronicle of the doings of the late Prince Consort, and will be read with interest by many who do not sympathise with "Jeames's" notions.

We have to record the decease of Mr. Peter Wright, of Dixon's Green, Dudley, an old and respected member of the Inventors' Institute.

Dr. P. W. Latham, who has acted as deputy for the Downing Professor of Medecine, has been elected to the professorship. This is, without doubt, putting the right man in the right place.

CAPTAIN BINGHAM'S PATENT REVOLVING STEEL SHUTTERS FOR ENGING-ROOM SKYLIGHTS.

At the Members' Meeting of the Inventors' Institute, on Thursday, December 3rd, 1874, F. H. Varley, Esq., Vice-President of the Council, in the chair, a paper by Captain T. R. Bingham on his Patent Revolving Steel Shutters for Engine-room Skylights was read by the Secretary, as follows :—

It will be in the memory of many how, and from what causes, the ill-fated ship London went down with nearly all on board. The terrible fate of the London and her living freight, numbering close upon three hundred souls, was a warning which at first produced a great and painful sensation; and I think it may be fairly deduced that it set many humane hearts thinking of a remedy, or at any rate of something that might possibly be done to guard against so terrible a calamity; and I was myself led to devise a scheme for diminishing, and in some degre palliating, the evil effects of the unprotected state of ships' hatchways, and more particularly the engine-room skylights, and of other openings in vessels and passenger steamers which so frequently lead to disaster, and loss of life and property. The contrivance devised was a set of hatchway protectors, or, called in my patent, secured in October, 1873, "The Patent Revolving Steel Hatchways," by which some security was effected in that, the most unprotected and weakest part of a sea-going ship. In this scheme I had several objects in view.

Firstly.—The efficient protection to the engine room hatchways.

Secondly.—A simple and not over expensive arrangement; easily applied, and not liable to get "out of order."

Thirdly.—A solid "ventilating" protection of great strength; easily applied, and easily removed, not interfering with the gear of any vessel, and that should be under the personal control of the ship's engineer, and under lock and key.

Fourthly.—I designed it of great strength, and in such a way as to be easy of application; simple in construction, and to insure absolutely free "ventilation" when "in use."

It now remains to be seen whether the English shipowners, the underwriters and insurance offices, as well as the consigners and shippers of goods, equally with our large passenger carrying companies, are alive to the necessity for the use of such an appliance for the security of passengers, the safety of the cargo, and the security of the engine-room and other "skylights" in sea-going screw steamers and vessels.

I will now proceed to explain in detail the various working parts of the invention in question; believing that the time has come for the same to be made public, and to be tested by actual trial and experience.

I, in the first place, premise that a vessel or steamer has passed the usual survey, and is in every way a sound ship. If of iron, I first place over the hatchway a set of semicircular girders of T iron, the ends of which pass through, and are bolted through decks, and to the beams supporting the deck. These being placed at two feet intervals along the hatchway, situate about six inches above the ridge of same and are in one piece, both ends going through, and being secured as above stated. Over these girders, I place, with due regard to their easy running, attachments by means of loose rings, a set of steel shutters made in long strips of "steel" loosely linked together and overlapping at the edges, very much in the style of the well-known revolving iron shutters used for closing shop fronts. These are made heavier and stronger, and admit of air between the edges of the "strips" so as to ensure perfect ventilation, and overlapping to such an extent at the edges, as that they ensure a perfect protection, and prevent the sea water or heavy sea, on striking it, from penetrating. The effect of such body of water, striking it in its descent, upon ships' decks being to more effectually close up and stop the entrance of water or of a heavy sea, thus effectually forming a ventilating safeguard to the glass and framework of such engine-room skylight. These revolving shutters can be made either in lengths or in one piece to fit the skylight, and they are simply rolled up when not in use upon an iron "core" alongside of "combing" of hatchway, and are enclosed in a longitudinal case of wood, running alongside of and attached to the "combing" of skylight. These being fitted with a lock and key, and suitable lid or cover, can be closed and locked by the chief engineer when not in use, and these cases on either side of combings of hatches can be used as seats for passengers. The method of unrolling these iron shutters is simple; a block and ordinary tackle are hooked on, and they are at once hauled out of case and slide upon the T girders, to which they are attached by "loosely fitting" links, and are drawn over and down to the opposite side of the hatchway or skylight, and bolted down to the deck by a simple mechanical contrivance, of which the engineer has the key, and by a turn of which he firmly locks down and attaches to the deck the ends of said iron shutters; thus completing the semi-circular protecting iron covering, and making all safe. The ends of skylight are protected in a permanent manner by a dome-shaped end with a deep "groove" into and along which "groove" the edges of rolling iron shutters fit, and thus connected, and joined to the ends of skylight in a firm and solid rim of iron. These domes for ends of skylights can be solid, and of either metal or wood, the "grooves" being of iron or gun metal, &c. I think it will be apparent that by this apparatus we secure the ends and the exposed surfaces of skylights, and I will not now enter into more details, because I do not wish to occupy a moment more time than is necessary, and in order to admit of any questions being put and answered. I think this short description of my patent will best answer the purpose I have in view, viz. :—of bringing it before the scientific gentlemen composing the Inventors' Institute, and to elicit, if possible, an opinion favourable to the same "upon its merits." I base my patent upon the well-ascertained fact, that up to date, scarcely any scheme has been tried or attempted for securing the most vulnerable and weakest part of a vessel (sea-going one), and I need not draw the attention of practical engineers to the manifest want of such an arrangement. It is only too well known to engineers, and especially to marine engineers, what risks and dangers these very flimsy and unsafe unprotected skylights and engine-room skylights expose them to. These remarks apply more particularly to vessels with low freeboard, to deeply-laden steam colliers, to P. and O. and other S.S. companies' vessels, carrying a vast number of valuable lives; and also to every class of vessel propelled by machinery, and in which, owing to immense length, there are especial risks of a kind only too well known to sea going men. The chief point in these patent revolving skylights or shutters is essentially the fact of their being *out of the way* when not in use or not required, and handy and instantly applied when the necessity arises. They are of such strength that they ensure immunity from falling spars, and from the heaviest sea; and I may fairly leave the public to judge of their merits, and of the urgent necessity for a trial on an extended scale. More especially I would call the attention of the Board of Trade to this invention, as one meriting their especial notice, and if only on the score of "humanity," and for the prevention of accidents and loss of life at sea.

After this paper had been read, the Chairman invited discussion, remarking that the subject of efficiently covering the hatchways of vessels so as to prevent the entrance of water, and yet allowing ventilation, was of great importance; and he therefore commended Captain Bingham's invention to the earnest consideration of those present.

Mr. MURRAY quite concurred in the chairman's statements regarding the importance of the subject before them. He had had some experience in sea transit, and as a result he was firmly convinced that if all deck openings could be effectually closed when needed, proper provision for ventilation being made, a ship could be rendered unsinkable. As regarded ventilation, he thought that would be best obtained by hollow masts or air shafts. However, Captain Bingham had devised a plan worthy of attention; he was quite sure the meeting would accord him a hearty vote of thanks, which he begged to propose.

Mr. VARLEY said he did not understand how ventilation was to go on when the glasses were shut.

Mr. HOLTEN thought that Captain Bingham's invention was far superior to the present plans of tarpaulin covers or wooden covers, and would prove a great advance upon anything at present in use. And although it might be true, as had been intimated, that the present system of hatchways was not the best system of shipbuilding for securing a water-tight hull, yet as that was the present system, he considered Captain Bingham's invention to be likely to do good service, as being capable of application to the present state of things.

Mr. CARTTAR said one thing struck him, as a matter though of detail yet of very great importance, and it was as to how the strips of the shutters were to be hinged or secured together so as to be sufficiently strong, and yet fulfil all the requirements of hinges for revolving shutters.

Mr. MORGAN remarked that although the question of hinges might be a difficulty, he did not see why it should prove an insuperable difficulty.

Mr. CAMPIN, the Secretary, then seconded the vote of thanks proposed by Mr. Murray, which was carried unanimously.

After this, another paper by Captain Bingham on Double-blade Rudder was read, and described as reported in our present number. This being over, with a vote of thanks to the Chairman, F. H. VARLEY, Esq., C.E., the meeting of 3rd December terminated.

BINGHAM'S PATENT DOUBLE-BLADE RUDDER—SLIDING PRINCIPLE.

THIS was the second paper read at the Inventors' Institute meeting on 3rd December. It was as follows:—

The urgent necessity now existing for increased power of rudder, has induced me to try to meet the want of such a contrivance of our sea-going merchantmen or canal steamers, and for the Suez Canal traffic in particular. After several trials, I came to the conclusion that to combine the qualities requisite—that is to say, a rudder at the time required, or on any emergency arising, should be of sufficient power to bring a ship or steamer around almost *in her own length*; as, for instance, only lately, two vessels, one of which was sunk within five minutes, sighted one another, and were unable, owing to the defective and weak steering apparatus, to avoid a collision, and consequent complete loss of one of the vessels, and of many lives on board. Amongst the various designs and schemes I have tried, there is one (and a very simple one it is) which, after I had considered it in every way, I felt bound to bring out and, at any rate, introduce to the public; not only on account of its simplicity, ease of application, and economy in construction, but chiefly because it *doubles* the power of the rudder when required, and is almost immediately re-stowed and out of the way. In a heavy sea, any *increase* to the area of a rudder becomes *a source of danger*; it therefore at once struck me that in order to effect the object of doubling the power of a steering apparatus or of a rudder, it would be equally and, if any thing, more than essential that it should be at once available on any sudden emergency arising, and also as quickly out of the way when no longer required. To meet these essential requirements, I now proceed to place before you a small model of the "Double-blade Rudder," which will speak for itself and obivate any explanation of use and action; also of the *modus operandi*, and of its working parts. You will observe that an ordinary rudder is sliced in two sections, or perpendicularly downwards, and divided into two parts so as to admit of a spare blade being introduced, and allowed to run upon "slots" at top and bottom. You will observe that the tackles are fixed to the rudder-head or close to it, and that they travel with the movements of the said rudder-head. They are used, as is evident, for hauling in and letting out No. 2 blade; the tackle itself being under the control of the man at the wheel, it stands to reason that on an emergency arising, by the helmsman simply easing off the "slack" or letting go the end of the rope of said tackle, that No. 2 blade at once, by its own "gravity," slides out and immediately *doubles* the power of the rudder, and the same, when no longer required, is hauled in by the said tackle and made fast. There are *two* "slots" in which the blade No. 2 slides out and in. The upper slot has a sliding action, and adapts itself to the curve of the "arc" described in sliding out the blade of No. 2. The lower slot has quite a different object and separate work to perform, and is cut more perpendicularly, and you will at once see why it is so. In order to afford greater grip and power to the lower end of blade No. 2, it slides *towards* the stern post, and thus whilst the blade is *sliding out at the top*, and along the top slot, it is by its own weight induced to slide *inwards* to the bottom of the lower slot, thus giving increase of grip at the base of rudder, and effecting it by its own gravity and weight, and favoured by the direction also of the slot itself. Thus we obtain the simplest form of sliding action outwards at the top, and an inverse action towards the stern post with the lower slot.

The reason I make use of the slot is to regulate the sliding action, and to control it easily, always in the same directions, and to obviate the complication of any hinges or other attachments. In actual practice, engineers are of opinion that the working of this plan will in a great measure depend upon the work, and as to how each part is fitted, and upon the fitting of slots and gear. I propose making the rudder of $\frac{5}{8}$ths iron plate, the centre No. 2 blade of $\frac{1}{2}$-inch plate and galvanized. The inner edges of the rudder will be firmly bolted in the usual way. I propose to increase the size of "rudder-head," and to give it a great increase of the strength, ("hexagonal" shape and hollow "of iron") in order to enable it to stand fully any extra strain coming upon it. I leave the rest of the working parts entirely to engineers, who will be able to adjust all, with due regard to the strength and varying strains to which a large area of rudder is subject.

After this paper had been read, several observations were made by members present on the importance of the subject, but the lateness of the hour prevented full discussion, and the subject dropped with the understanding that Captain Bingham should be allowed to bring the matter forward for full discussion on another occasion.

The thanks of the Institute for this communication were, however, ordered to be included in the vote of thanks for Captain Bingham's other communication on Engine-room Skylight Shutters.

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President of Council:

SIR ANTONIO BRADY.

MEMBERS MEETINGS AT 8 P.M.
Thursday, January 14, Patent Law Conference.
Thursday, January 28, Adjourned discussion on Captain Bingham's Paper "On Rudders."
Council and Executive Meetings on the same Evenings at 7 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

On 3rd December, 1874, the Council met *pro forma.* The Executive Committee then proceeded to business, the chair being occupied by Mr. F. H. Varley, Vice-President of Council. Some formal business having been disposed of it was resolved, upon the motion of Mr. Murray, seconded by Mr. McLauchlan,

"That the Council, taking into consideration the tenour of their correspondence with the Lord Chancellor, considers that it will be necessary that the deputation be confined to those mentioned in the letter directed to his Lordship, and the memorial to be presented, and statements to be made on that occasion, be in accordance with the terms of the resolution passed at the meeting of the 26th ult., of which the Council approve."

It was also resolved that the Secretary be directed to bring this resolution to the notice of the President and Committee of Deputation. Carried unanimously.

On 14th of December, 1874, the deputation from the Institute had an interview with the Lord Chancellor (Lord Cairns). It was very numerously attended. Sir ANTONIO BRADY, President of the Council of the Institute, introduced the deputation. The Secretary (Mr. F. W. Campin) then read the memorial, a copy of which is given in another column. Captain Selwyn, R.N., Mr. Hinde Palmer, Q.C., Mr. James Howard, Mr. Peacock, Mr. T. Paterson, Mr. Lester, and others, spoke in explanation, and a full report of what passed will appear in our next.

On 17th of December, 1874, the Council met *pro forma.* The Executive Committee proceeded to business. Captain Selwyn, R.N., Vice-President of the Institute, occupied the chair, and the minutes of the last meeting having been read were confirmed as correctly entered.

At the members' meeting on 3rd December, two papers by Captain Bingham were read and discussed, as reported in another column.

At the members' meeting on 17th December, Mr. Gadd, C.E., Manchester, read a paper, which was followed by discussion. It will be reported in our next.

Monthly Notices.

A new Arctic Expedition was determined on by the Cabinet on Thursday, the 12th ult., and it is rumoured that Capt. Markham, R.N., who made a voyage, some time ago, to Baffin's Bay, in the Dundee whaler, Arctic, will command one of the two vessels of the expedition.

The Death of Dr. E. Smith, F.R.S., Assistant Officer of the Local Government Board, has been announced.

Dr. R. Ball, F.R.S, has been appointed Professor of Astronomy in the University of Dublin,

The unexpected death has been announced of Dr. Archibald Campbell, in his seventieth year—a loss to Himalayan India and Bengal, and to scientific circles in London.

Diamond Boring in the Weald is now at a standstill, no progress having been made since the very unfortunate breaking of the rods in the hole—about fifty feet of broken rods still remaining to be extracted. The Diamond Boring Company's engineer, however, is satisfied that they will overcome this difficulty in a short time, and then rapidly proceed with the boring.

The Marine Survey in India is about to be resumed. To Commander A. D. Taylor, late of the Indian Navy, and a practical surveyor, has the duty been entrusted by the India Office of organizing and conducting the survey; having had much experience in India, it is believed that the survey could not have been committed to better hands. Experienced surveyors from the Imperial Navy are to assist him.

An interesting paper on the distribution of Auroras has recently been published by Prof. H. Fritz. He has succeeded in constructing a map on which a series of curves exhibits lines of equal amount of frequency and intensity of the auroras, similar to those well-known ones which represent the meteorological and magnetical conditions of different parts of the earth. These curves stretch farthest to the south on the eastern side of North America, and approach nearest the geographical poles in Siberia. Thus, Berlin is nearly on the same line with Okhotsk, in Eastern Siberia, and with Charlestown in the United States.

Socialism, an unfinished essay left by Mr. Mill, is to be published next year.

Lieut. Payer will issue a volume describing the recent Arctic Expeditions, in each of which he has taken part, Messrs. Macmillan to be the publishers.

Early in next year will be published a work by Mr. G. H. Chubb, upon the subject of security of property from fire and thieves. Much practical information has, we learn, been communicated to the author by Capt. Shaw, of the Fire Brigade. The volume will be dedicated to Lord Henry Lennox.

The Rev. David Hogg, of Kirkmahoe, is preparing for publication a "Life of Allan Cunningham."

A new American Cyclopædia, says the *Athenæum*, is, we learn, in the course of preparation. It was projected by the late Mr. Horace Greeley, and begun by him. Since his death, the editorship of the work has passed into the hands of President Barnard, of Columbia College, New York, and of Prof. A. Guyot. It is intended to be in three stout volumes, the first of which will be out next month, and it numbers amongst its contributors many scholars of eminence in the United States. A novel feature in the work will be found to be the numerous articles furnished by literary and scientific Englishmen.

M. G. Freytag has in the press the third part of "Die Ahnen." Its title is "Die Brüder vom deutschen Hause."

The Right Hon. W. E. Baxter, M.P., has revised for the press the lecture he recently delivered to his constituents on "Free Italy." It will be published by Messrs. Cassell, Petter, and Galpin.

We read the following in the *Athenæum*:—

The Australian Imperial Academy is about to publish an edition of the Latin Fathers under competent editors. Such a work will be of use to students, especially if brought out at a price that will enable persons living out of the way of large libraries to possess it for themselves. Even the Abbé Migne's edition of the Fathers has been of use in this respect, but it is not so trustworthy a work as we may now hope to receive.

The average sale daily of Mr. Gladstone's pamphlet on the Vatican Decrees has been stated as 7,000 copies.

The German Emperor has conferred the Order of the Crown upon Dr. S. Birch, in recognition of his exertions in connection with the Congress of Orientalists, held in September last.

The Executive Committee of the Mill Memorial Fund has recently met, in consequence of the death of Mr. Foley, R.A., who had made no progress with the execution of the statue which is to be placed in the garden before the new offices of the School Board. It is probable that Mr. Woolner, A.R.A., will now be entrusted with the execution of the work.

The chemical action of the sun's rays in summer ceases, in the Lake of Geneva, at the depth of between forty and fifty metres. The depth to which the chemical rays penetrate in water has never before been ascertained. This has been determined by M. Forel, who has communicated his researches in a memoir to the Société Vaudoise des Sciences Naturelles.

A lamp for burning the vapour of bisulphide of carbon mixed with nitric oxide gas a mixture which, on ignition, burns with an intensely luminous flame of high actinic power, but usually of only momentary duration, has been produced by MM. Delachanel and Mermet. The nitric oxide is, it appears, generated by the action of iron on a mixture of nitric and sulphuric acids, and after mixture with vapour of bisulphide of carbon, the mixed gases are burnt in a kind of Bunsen's burner, the products of combustion being rapidly carried off by a chimney. For photographic purposes this new flame is said to be superior to that of the magnesium lamp, whilst it is estimated to have twice the chemical power of the oxyhydrogen flame, and three times that of the electric light.

The Académie des Sciences have elected M. Bertrand as perpetual Secretary for the Section of Mathematical Sciences, in the place of M. Elie de Beaumont.

An attack by a rat on an octopus at the Aquarium of the Zoological Station at Naples resulted, it is said, in the rat getting the worst of the battle, as next morning nothing remained of the rat but the bones and a part of the skin.

Davy Medal.—There is a prospect that this will be awarded for the first time next year, the fund having sufficiently accumulated. Years ago, the coalowners in the north subscribed £2,500 for a service of plate which they presented to Sir Humphry Davy, in recognition of his invention of the safety-lamp. This service was bequeathed prospectively to the Royal Society, with proviso that it should be melted and sold to raise a fund for a medal to be awarded annually for the most important discovery in chemistry, made anywhere in Europe or Anglo-America. After the decease of Dr. John Davy (Sir Humphry's brother), the provisions of the will were carried out. The melted plate realized £736 at the Royal Mint, and it is the interest of that sum which will provide the annual medal.

"*The Mutual Help Association*" is the name of a new society that has recently been commenced in England. It purports to be "an association of all workers, male or female, for mutual help," and the means employed appear to be a new system of cooperation in producing, manufacturing, and distributing. Already there are, it is stated, over fifty branches in the United Kingdom. The address of the general secretary is W. H. Riley, 7, Bedford-road, Clapham Rise, London, S.W.

Arthur Woolf, who is familiar to engineers in connexion with the engine which bears his name, is but little known to the public, although he was one of the greatest benefactors to his country. The man who could, as Woolf did, advance the duty done by a bushel of coal from 3,000,000 lb. raised a foot high to 50,000,000 lb., should have a place beside James Watt. We are, therefore, glad to see that "The Life and Labours of Arthur Woolf, of Camborne," has been the subject of a paper by Mr. S. Hocking, C.E., read before the Miners' Association of Cornwall and Devonshire.

The Christmas Juvenile Lectures of the Society of Arts are to be continued. Prof. M'Leod, of the Indian Engineering College, has undertaken to talk to the young people about "The Food and Work of the Iron Horse."

Proceedings of Societies.

ROYAL SOCIETY.

November 19th.—W. Spottiswoode, Treas. and V.P., in the chair.—A vote of condolence with the president under his bereavement was unanimously agreed to. Dr. H. W. Rumsey was admitted into the society. The following papers were read:—"Note to the Report on the Exploration of Brixham Cave" (*Phil. Trans.* 1873), by Mr. G. Busk,—"On the Tides of the Arctic Seas: Part IV. On the Tides of Northumberland Sound at the Northern Outlet of Wellington Channel; Part V. On the Tides of Refuge Cove, Wellington Channel," by the Rev. S. Haughton,—and "On Musical Duodenes; or, the Theory of Constructing Instruments with fixed Tones in Just, or practically Just, Intonation," by Mr. A. J. Ellis.

November 26th.—W. Spottiswoode, Treasurer and V.P., in the chair.—The following paper was read: "Preliminary Notes on the Nature of the Sea-bottom, procured by the Soundings of H.M.S Challenger, during her Cruise in the Southern Sea in the early part of the Year 1874," by Dr. W. Thomson.

November 30th.—Anniversary Meeting.—W. Spottiswoode, Treasurer and V.P., in the chair.—The annual address was delivered.—The medals were presented, the Copley Medal to Professor Pasteur, of the Academy of Sciences, Paris; the Rumford Medal to Mr. J. N. Lockyer; the Royal Medals to Mr. Sorby and Professor W. C. Williamson.—The council and officers for the ensuing year were elected, as follows: President, Dr. J. D. Hooker; Treasurer, W. Spottiswoode; Secretaries, Professor G. G. Stokes and Professor T. H. Huxley; Foreign Secretary, Professor A. W. Williamson; other Members of the Council, Professor J. C. Adams, the Duke of Devonshire, Captain F. J. O. Evans, R.N., J. Evans, A. C. L. G. Günther, D. Hanbury, Sir J. Hawkshaw, J. N. Lockyer, R. Mallet, N. S. Maskelyne, C. W. Merrifield, Professor E. A. Parkes, Right Hon. Playfair, A. C. Ramsay, Major-General Sir H. C. Rawlinson, and J. S. B. Sanderson.

SOCIETY OF TELEGRAPH ENGINEERS.

The president of this, the youngest of the scientific societies, invited the members to a *conversazione* recently in the rooms of King's College, kindly lent by the Council. Mr. Siemens, head of the well-known firm of telegraph constructors, was the first president of this association, started in 1871 for the study of electrical science; and he was followed by Mr. Scudamore and Sir W. Thomson, at whose invitation a few evenings since all the men eminent in the telegraphic world, with but few exceptions, were assembled. The rooms were filled with all kinds of telegraphic machines, portions of submarine cables, galvanometers, electromotors, &c. In the corridor was exhibited a recent invention of the president's—the eclipsing gas-light, for distinguishing lighthouses, instead of the old system of revolvers. The light by his invention is at varying intervals eclipsed, and the name and position of the lighthouse are known by the number and length of the flashes, as they are called. Mr. Thompson showed a very recent invention, the "electric gas-lightning apparatus," which explains itself by its name. Messrs. Warden, Muirhead, and Clark exhibited the president's syphon recorder, with some recent improvements introduced by him, Mr. R. S. Culley had on his table the electromotograph, showing a recent discovery by Mr. Edison, of New Jersey, U.S.A., which may lead to important results, although at present of no practical value. Briefly stated, it is that by passing an electric current through the tin pen of a Baine's instrument and using paper prepared with a solution of caustic potash, friction is entirely destroyed. Mr. J. Mathieson from the Silvertown Works, had a large audience round him during the evening as he explained his torpedo apparatus. Another exhibition especially interesting to engineers was a machine by which the height of the tide at any time and at any place may be calculated with great accuracy. There were several specimens also of the Direct United States Cable, which under present circumstances were examined with great attention. It is impossible to mention in so limited a space all the noteworthy exhibitions, a notice of those of latest introduction must suffice. One exception to this rule should be made in favour of Mr. J. Mackie's typesetting machine, which, placed in the refreshment room, naturally attracted the attention of the crowds who congregated there.

THE INSTITUTION OF CIVIL ENGINEERS.

At the third Ordinary Meeting, 1874—75, on 24th November, Mr. Thos. E. Harrison, President, in the chair, the paper read was on "The Pennsylvania Railroad, with remarks on American Railway Construction and Management," by Messrs. Charles Douglas Fox and Francis Fox, M.M. Inst. C.E., which we give in another column.

SOCIETY OF PUBLIC ANALYSTS.

A general meeting of this society was held a few days ago at the Cannon-street Hotel; Dr. Redwood in the chair. Among the members of the society present were Mr. G. W. Wigner, Mr. Heisch, joint hon. secretaries; Mr. Eastcourt, Mr. Jones, Dr. Tripe, Mr. J. A. Wanklyn, Dr. Stevenson, Mr. Allen, and Dr. A. Dupré. A report was read by Mr. Wigner from the committee appointed at the meeting on the 7th of August last to complete the frame of the constitution of the society, and to draw up a code of rules. It stated that the committee had prepared a definition of adulteration comprehensive enough to include all actual adulterations, and elastic enough to prevent oppression or injustice. This definition they laid before the meeting, not intending it, so far as phraseology was concerned, as a final one, or to be published as the society's definition, but only as an attempt, which they considered a successful one, to explain in intelligible language what should be considered as an adulterated article. The adoption of this report having been moved by Dr. Tripe, and seconded by Mr. G. Turner, it was carried unanimously. The Chairman then said that the most important subject of the evening was, to complete the final organization of the society. The committee they had appointed had devoted a good deal of their attention to drawing up a constitution, with a view to submitting it for their approval, and as chairman he had been requested to move its adoption. The society had three spheres of action, which he thought it would be generally admitted legitimately appertained to them as public analysts. The first was to promote and maintain the efficiency of the laws relating to adulteration. Secondly, to promote and, as far as possible, to secure the appointment of competent public analysts. Thirdly, to advance and diffuse among the members of their association that scientific and technical knowledge which would best conduce to the efficient performance of their duties. The Secretary then read the code of rules forming the constitution, to which a few modifications were suggested by Dr. Tripe, and adopted by the meeting. The adoption of the code was seconded by Mr. Wanklyn, and carried unanimously. Dr. Tripe proposed and Dr. Muter seconded a vote of thanks to the committee, which was also carried. Mr. Allen called attention to a private publication which professed to be the evidence given before the Parliamentary Committee on the Adulteration Act. The publication in question, which was the production of some person or persons in the tea-trading interest, contained misrepresentations of evidence and omissions of a kind to alter the character of the evidence given with regard to adulteration. Mr. Eastcourt said that the publication was objected to as it was printed in the form of a Parliamentary Blue-book, and with the object of misleading members of Parliament. A long discussion then took place upon the definition of an adulterated article. Eventually a resolution which had been moved by Dr. Heisch and seconded by Dr. Dupré, to the effect that the following definition was a fair one of an adulterated article, and should be recommended to the council of the society as one which might be advantageously taken for their guide was carried:—"An article shall be deemed to be adulterated: A. In the case of food or drink—1. If it contain any ingredient which may render such article injurious to the health of a consumer. 2. If it contain any substance that sensibly increases its weight, bulk, or strength, unless the presence of such substance be due to circumstances necessarily appertaining to its collection or manufacture, or be necessary for its preservation, or be acknowledge at the time of sale. 3. If any important constituent has been wholly or in part abstracted without acknowledgment being made at time of sale. 4. If it be a colourable imitation of, or be sold under the name of, another article. B. In the case of drugs—1. If when retailed for medicinal purposes under a name recognised in the British Pharmacopœia, it be not equal in strength and purity to the standard laid down in that work. 2. If when sold under a name not recognised in the British Pharmacopœia, it differ materially from its professed standard." The remainder of the business consisted of a discussion on the standards of the articles referred to.

ROYAL SOCIETY OF LITERATURE.

November 25th.—Sir P. de Colquhoun, V.P., in the chair.—Mr. C. H. E. Carmichael gave an account to the society of the festival held at Padua, during the last summer, in honour of Petrarch; and pointed out the remarkable difference in the ceremonial, &c., adopted, for the same purpose, at Padua and at Avignon.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

December 1st.—Dr. S. Birch, President, in the chair.—The following candidates were nominated for election: Rev. T. D. Harford, Colonel N. D. Barton, Rev. W. Brewster, Mrs. H. Brogden, Mrs. De Burgue, Rev. T. P. Dale, Dr. F. Delitzch, A. Forbes, W. J. Freer, Rev. Dr. Kessen, J. W. Lea, Rev. C. Lee, S. P. Moore, R. M. Mills, T. P. Napier, Rev. Dr. Robbins, R. N. Roberts, and F. Seebohm.—The following papers were read: "On a Mythological Inscription on the Tomb of Seti V., at Thebes, by M. Edouard Naville,—and "On a Monument of Haremhebi," by Dr. S. Birch.

ANTHROPOLOGICAL INSTITUTE.

November 24th.—Professor Busk, President, in the chair.—Messrs. C. J. Tinson, F. D. Watson, and A. White were elected members. —Colonel Lane Fox exhibited and described specimens of stone implements, bows, arrows, and blow-pipes, from San Jose, Costa Rica. —Mr. Charlesworth exhibited characteristic figures, carved in amalgam by Mexican miners, and a chaplet of gold and silver coins as worn by the women of Nazareth.—A brief paper, by the late Mr. Cotesworth, "On Ruins in the Neighbourhood of Palmyra, with Notes on some Skulls found therein," was read by the President. The ruins described were groups of towers and tombs lying north and south of the Kuryelein road on the hills facing the Castle. In one of these towers were discovered many skulls and other human remains, some of which were exhibited on the table. The date of their deposition could not, in the opinion of the author, be less than from 1,800 to 2,000 years ago. There were large underground tombs showing the same arrangements as in the towers. An examination of the remains by the President showed that they belonged to individuals of a dolichocephalic race, of large rather than small stature, but by no means gigantic. A short time since, Captain Burton had forwarded skulls to the Institute, presenting the same characteristics as the specimens under consideration.—Mr. W. Bollaert contributed some notes on Peruvian Antiquities, and exhibited a series of drawings and photographs in illustration, which he gave to the Institute.

GEOGRAPHICAL SOCIETY.

November 23rd.—Major-General Sir H. C. Rawlinson, K.C.B., president, in the chair. Sixty new fellows were elected. The paper read was, "Journey Across the Western Interior of Australia," by Col. P. E. Warburton.

GEOLOGICAL SOCIETY.

November 18th.—J. Evans, Esq., president, in the chair. Messrs. G. H. Piper, J. Peter, and C. J. Homer were elected fellows. The papers read were: "On Fossil Evidences of a Sirenian Mammal (*Eotherium Ægyptiacum*, Ow.) from the Nummulitic Eocene of the Mokattam Cliffs, near Cairo," by Prof. Owen, and "On the Geology of North-West Lincolnshire," by the Rev. J. F. Cross, M.A.

CHEMICAL SOCIETY.

November 19th.—Prof. Odling, President, in the chair.—Dr. C. R. A. Wright read a paper "On the Action of the Organic Acids and their Anhydrides on the Natural Alkaloids, Part II.," by himself and Mr. G. H. Beckett, being a continuation of that which he brought before the Society at the last meeting. Prof. W. K. Clifford made a communication "On General Equations of Chemical Re-actions," proving mathematically, from the kinetic theory of gases, the generally adopted method for expressing chemical re-actions. A discussion ensued, after which the following papers were read: —"On Propionic Coumarin and some of its Derivatives," by Mr. W. H. Perkin; "On the Composition of Autunite," by Prof. A. H. Church; and "On the Action of Bromine on Protocatechnic Acid, Gallic Acid, and Tannin," by Mr. J. Stenhouse.

METEOROLOGICAL SOCIETY.

November 18th.—Dr. R. J. Mann, President, in the chair.—The following gentlemen were elected Fellows:—Dr. Pearde, Messrs. I. Ashe, E. Hubbard, G. W. Ormerod, H. C. Russell, and F. Shaw. The President read a "Report concerning the Meeting of the Conference on Maritime Meteorology in London, August 31, 1874," which gave a summary of the deliberations and decisions arrived at by that meeting. At the request of the President, Mr. R. H. Scott gave a brief account of the recent meeting of the Permanent Committee of the Vienna Congress at Utrecht. The following papers were read:—"On the Weather of Thirteen Springs," by Mr. R. Strachan; "Table for facilitating the Determination of the Dew-Point from Observations of the Dry and Wet Bulb Thermometers," by Mr. W. Marriott, Assistant-Secretary. The chief feature of this table is that it gives, for the difference between the readings of the dry and wet bulb thermometers, the amount to be subtracted from the reading of the wet thermometer instead of from that of the dry, as is necessary with the other tables now in use, whereby a saving of time, as compared with the ordinary method, of more than one-third is effected. "On the Heat and Damp which accompany Cyclones," by the Hon. R. Abercromby.

SOCIETY OF ARTS.

November 25th.—Sir C. Reed in the chair. —Nine new members were elected. A paper was read by Mr. T. R. Smith, "On School Buildings and Fittings."

PHYSICAL SOCIETY.

November 21st.—Dr. Gladstone, President, in the chair.—Eight new members were elected. Prof. M'Leod made a communication on a simple apparatus for showing internal resistance in battery cells. Mr. J. B. Hamilton read a communication "On the Application of Wind to Stringed Instruments." Mr. Hamilton commenced with a short history of the efforts which had been made to bring the Eolian harp under human control, and explained how he himself had taken up the matter from Mr. J. Farmer on leaving Harrow School. Mr. Farmer had succeeded in getting wind to do the work of a bow upon a string by attaching a reed to the end of it, forming thus a compound string, from which a few notes of great beauty could be obtained. Mr. Hamilton, in attempting to complete a perfect instrument, soon found he had undertaken an almost impossible task, from difficulties which he explained to the Society. Failing to obtain advice or assistance either from scientific men or from the musical instrument makers, he was once more thrown upon his own resources, and, conscious both of his responsibility and difficulties, resolved to leave for a time his University career, and to investigate to the uttermost a matter on which no information could be obtained. The results of his investigations were then shown to the meeting. After two years of labour, Mr. Hamilton had not only gained experience sufficient to perform what he had undertaken, but had also discovered that by a different mode of employing the same materials, *i.e.*, a string and a reed, he could secure for a string the advantages afforded by an organ-pipe in addition to those which it already possessed. Showing a pianoforte-string on a sound-board, he said, "Such strings already possess certain advantages—first, simplicity of reinforcement by a common sound-board; second, economy of space; third, blending of tone; fourth, sympathy. Can I also secure for this string the advantage of an organ-pipe?" Accordingly, an open diapason-pipe was proposed for imitation, and, to the general surprise, the string was made to exactly imitate it in all these respects. Another string was next sounded, representing the note of the largest organ-pipe in use, in conjunction with other notes, satisfying the hearers that not only could a string do all the work of an organ-pipe in giving volume and sweetness to the note reinforced, but could afford the exquisite sympathetic and blending power hitherto peculiar to strings. Such notes were also sounded seven octaves apart. The reinforcement corresponding to the pipe was secured by the utilization of a node which cut off from the string a segment corresponding to the note reinforced, presenting to all appearance the phenomenon of an organ built by nature out of a string. This node, being a source of motion, is also utilized for gaining quickness of speech, since a cord, acting as a damper, and stretched across the nodal line of a series of strings, serves to communicate instantaneous sound from key to key. Another invention of Mr. Hamilton's was a string which could not be put out of tune, to the great surprise of those who attempted to do so. He also exhibited a new pianoforte-string, which, by its purity and volume of tone, showed that the results of a grand pianofore could be obtained from a cottage instrument.

We regret to see the death announced of Sir William Jardine, of Jardine Hall, Lockerdie, N.B. Enthusiastically devoted to the study of natural history, and especially of ornithology, Sir William made valuable contributions to that department of science.

MEMORIAL TO LORD CHANCELLOR ON THE PATENT LAWS.

To the Right Honourable the Lord Cairns Lord High Chancellor of Great Britain, &c., &c., &c.

Humble Memorial of the Inventors of Great Britain and Ireland, represented by the Inventors' Institute.

Sheweth,—

That the present unsatisfactory state of the patent laws renders it, in the judgment of your memorialists, absolutely necessary that a considerable amendment of those laws should be at once effected.

That no system of patent law appears to be better adapted to meet the requirements, either of inventors or the public, than that in operation in the United States of America, in which the following important points are provided for.

(*a*). Cheapness in the cost of obtaining patents.

(*b*). Provisions for a searching system of preliminary examination of the invention by a permanent staff of examiners

(*c*). Extension of time for which patents are granted.

(*d*) A large and efficient organization as a separate department under a high official directly responsible to the representatives of the nation, and having well arranged museums and offices where information on the subject of inventions and patents can be obtained by the public.

Signed on behalf of the memorialists,
A. Brady, Knt., &c., President,
F. W. Campin, Secretary,
Inventors' Institute.

AMERICAN RAILWAY CONSTRUCTION AND MANAGEMENT.

By Messrs. C. D. Fox and F. Fox, M.M. Inst. C.E.

The following is an abbreviation of the paper read by the above-named, at the Institution of Civil Engineers, on 24th of November, entitled "The Pennsylvania Railroad, with remarks on American Railway Construction and Management."

The Pennsylvania railroad consisted of a main double line from Philadelphia to Pittsburgh—a distance of 354 miles—with nine branches of an aggregate length of 263 miles, or a total of 617 miles. The total length of single line, including slidings, was 1,226 miles; besides which the company leased or worked an additional length of 1,947 miles, chiefly single lines. The cost of the railroad, with stations and rolling stock, has been 33,806,000 dols., or about £10,000 per mile.

The earthworks of the main line were heavy in many parts; and the inclines carrying the railroad over the Alleghany Mountains, although the gradients were moderate in comparison with those on other passes, were amongst the most important of the kind in America. The guage was 4 feet 9 inches. The width at formation level, on embankment, was 24 feet 3 inches, and in cuttings, in ordinary soil, 32 feet, and in rock, 28 feet. There were numerous bridges for carrying the railroad over streams. The Mount Union Bridge, of five spans of 121 feet 6 inches each, had three main trusses with the railroad on the top. These trusses were constructed upon the stiffened triangular system. To support the upper member and convey the strains more directly to the abutment, a short strut composed of two channel irons, with distance pieces, was inserted in the middle of each bay; the point of junction of this strut with the diagonal and the top flange, being again tied to the adjoining vertical in the direction of the middle of the bridge. There were eight tunnels of the aggregate length of 2,646 yards, the longest being 1,204 yards. The permanent way or track on the main line was of unusual strength for an American railway. The standard section of rail now used weighed 67 lbs. per yard, and was of steel, $4\frac{1}{2}$ inches high, with a base 4 inches wide. There was no general system of signals, and even indicator signals were uncommon. The old form of sliding rail was almost universally adopted in lieu of the switch. The traffic was regulated, by telegraph. The different classes of locomotives were designated by the first seven letters of the alphabet; but there were only three well marked types, viz.: the eight wheel, the ten wheel, and the "shifter," or shunting engine. The greatest importance was attached to interchangeability of parts. An idea might be formed of the uniformity existing amongst the several types from the fact, that whilst 112 patterns were required for one engine, 187 included all the seven classes, exclusive of the tender, which was alike for all. The locomotives had leading trucks of the variety known as the "swing centre." The trucks had chilled cast-iron wheels. Steel wheels had been tried, but would not bear the severe work of guiding the locomotive over the sinuosities of the line. The weight of a cast iron wheel of a passenger car was 525 lbs.; it cost about £4 sterling, and had a life of a least 100,000 miles. The metal was charcoal iron, having a tensile strength sometimes reaching 18 tons per square inch, and averaging nearly 15 tons per square inch. The driving wheels were of cast iron, with hollow spokes, counterbalanced with lead. They were fitted with steel tires, except for shunting engines, where chilled tires were more durable. The boilers were of soft crucible steel, the shell of the larger one being $\frac{3}{8}$ inch thick, and of the rest 5-16ths inch thick. The fire-box was also of steel, $\frac{1}{4}$ inch thick, with the exception of the tube-plate, which was 7-16ths inch thick. The passenger cars, including sleeping cars, compartment, vestibule, parlour, drawing-room and "silver-palace" cars, all of which were the result of a pressing necessity for the invention of new superlatives of excellence, many of the public being too nice to travel simply first class, resembled those in general use on the best railroads of the States. The weight of an old-fashioned sleeping car was 20 tons, of a "palace car" 26 tons, giving in one case 17 cwt., and in the other $21\frac{3}{4}$ cwt. to each passenger. The cars were lighted by ordinary coal gas, compressed to about 300 lbs. per square inch, in tanks under the body of the car. The Westinghouse pneumatic continuous break had been in general use for several years. The goods waggons or freight cars were of five kinds. The whole of the rolling stock was provided with combined central buffers and drawbars, and the trains generally were loosely coupled. On the Pittsburgh section of the line water troughs, similar to those on the London and North Western railway, were laid down to supply the locomotives when running at speed. By their use the express trains were enabled to run regularly from Altoona to Pittsburgh, a distance of 117 miles, without stopping, in four hours, or at an average speed of nearly 30 miles an hour.

Leaving out of consideration some unimportant tramways opened between 1826 and 1831, and worked by horse power, American railroad construction fairly commenced in 1831, when a section of the Baltimore and Ohio railroad, about 60 miles in length, was first worked by steam power, the engine being of American construction. The Mohawk and Hudson railroad was opened and worked in the same year by an engine of English make of 6 tons weight, which being too heavy, was replaced by an American locomotive of 3 tons weight. The guage of these railroads varied from the 6 feet guage of the "Erie," through the gradations of 5 feet 6 inches, 5 feet, 4 feet 10 inches, 4 feet 9 inches, and 4 feet $8\frac{1}{2}$ inches, to the 3 feet gauge of the Denver and Rio Grande, a line of considerable length. Where timber was abundant, wooden railroads had sometimes been introduced. The permanent way then cost about £240 per mile. The severity of the climate in the Eastern States added greatly to the cost of maintenance. Moderate falls of snow were cleared by a small plough attached to the cowcatcher; but for heavy drifts snow-ploughs of more elaborate construction were necessary; and even with these, days often elapsed before the line could be cleared. Progress in railroad construction in the United States had not extended hitherto, in any great measure, to lines for the daily use of those who dwelt in the chief cities. Whilst this was true of the large centres of trade, it was curious, on the other hand, to notice how main lines were carried on the level, and without protection, through the streets of considerable towns, the express trains often running through without stopping.

PROGRESS IN PRINTING.

The New Patent "Polychrome" Printing Process, for printing any number of colours at a single impression.—Colour-printing, as at present practised, necessitates the use of a separate engraved plate, block, or stone for each colour required; whilst, to prevent the inks from blurring or smearing, time to dry must be allowed between each successive working. Under the "Polychrome" process, any number of colours or varied shades can be printed at a single impression without the use of the ordinary printing inks, or the engraving of any plates, blocks, or stones, —the prints, moreover, becoming, perfectly dry in a few minutes. The process may be briefly described as follows:—Colours, prepared in solid slabs, are cut out and inlaid according to the design to be produced, being held together in a sliding frame The surface of the combined block is then ground perfectly smooth and the "Polychrome" prints worked off with great rapidity, drying immediately. If a very clearly defined outline or high degree of finish is required, the ordinary method of lithography or block printing can thus at once be applied in combination with the new process. The blocks of combined colours may be of any thickness according to the number of impressions required, it being estimated that a half-inch block [will give about 8,000 prints. The simplicity of the new system, as compared with the old, is self evident. The economy, as well as rapidity with which coloured illustrations of various kinds will be produced under it, cannot fail to largely augment the application of chromo-printing to newspapers, maps, books, and cheap literature generally, whilst for ordinary commercial purposes the already great demand for printing in colours will be still further increased. The processes were explained and exhibited in operation at Messrs. J. M. Johnson and Sons' machinery, in Room V. of the London International Exhibition, during the last few weeks before its close.

PRODUCTION OF DISEASE BY PARASITIC ANIMALS.

Ever since it was understood by men of science that the changes which we call "fermentation" were due to the growth of very lowly organized fungi in the fermenting liquids, medical men and physiologists have had the notion that certain diseases, those of the zymotic class, as they have been termed, such as scarlet and typhoid fever and small-pox, may be due also to the growth and activity within the blood and tissues of the human body of lowly organized fungi. More recently it has become a demonstrated scientific fact, that all putrefaction is due to the life of minute organisms which swarm in the putrefying material. These are the organisms known as Bacteria; and it has been shown that there are a series of varieties of putrefaction, each of which has its special and appropriate Bacterium as the cause, and that in the absence of Bacteria or allied organisms, putrescible substances remain perfectly sweet. Thus in some putrefactions one kind of smell and corresponding fœtid chemical substances are produced, in other putrefactions other such fœtid substances of a distinct kind. Moreover, in some cases the special kind of Bacterium at work produces a vivid colouring matter, red, or green, or blue, according to the species. Now these discoveries have helped on considerably the acceptance of the theory that many diseases are due to the presence in the human body of minute organisms. Just as there are colour-producing and smell producing Bacteria, so there are disease-producing Bacteria, that is to say, Bacteria the effect of whose life and multiplication in the blood and other fluids of the tissues is to produce poisonous chemical conditions in those fluids. There are certain diseases in which Bacteria have been detected in great quantity in the blood, and to which we are justified theoretically in attributing the disease. In the lower animals, amongst silk-worms and other very humble creatures, such diseases have been very clearly traced to the presence of enormous numbers of excessively minute and simple corpuscles, which are of a similar nature to that of the minute fungus-like organisms known as Bacteria. In man, there is no doubt that the terribly fatal disease, known as malignant pustule, is accompanied by, and probably caused by, enormous numbers of a minute Bacterium. This fact has been established within the last two or three years, as also the fact that pyæmia—the putrefaction of the blood which follows after the putrefaction of wounds—is equally connected with the presence of swarms of Bacteria in the blood. Again, the swiftly fatal and little known pyæmic condition which so recently took from us a most able physician, Dr. Anstie, was in all probability onother of these Bacterious diseases. Now these facts stand upon much surer and more numerous observations than any of the "fungoid theories" of disease which have before engaged the attention of medical men. We are really beginning to see light in this matter. But most important of all, and claiming really the very closest attention at this moment, are the recently published discoveries of Prof. Klein, of the Brown Institution in London, an observer whose character for accuracy and acuteness is so well known, that his statements may be accepted with full reliance. Dr. Klein has shown, and can still show by means of his prepared microscopic sections, that in the small-pox of the sheep the lymphatic vessels in the loose tissue beneath the skin and elsewhere are occupied by the branching filaments of a fungus-like organism. In the pustules which form on the surface these filaments give rise to minute rounded spores, and it is these spores which have been seen by other observers and recognized as special "corpuscles" of the diseases small-pox and vaccinia. Dr. Klein's account of this organism is published by the Royal Society. Further, Dr. Klein has extended his researches to other zymotic diseases, and has very recently published his results as to typhoid fever. He has made the most careful microscopic study of the intestines, which become ulcerated, and are the chief seat of mischief in typhoid. Dr. Klein finds that minute round yellowish-green coloured organisms are present in immense quantities both in the tissues of the intestinal wall and in the villi on the surface. At present Dr. Klein has not published figures of either of these organisms—the fungus of small-pox or the micrococci of typhoid—but we may have sufficient confidence in his accuray as an observer and his entire freedom from theoretical prepossession to accept the result of these researches as definitely establishing the parasitic origin of some, at any rate, of the zymotic diseases.

In connection with the above we may mention that Mr. H. C. Sorby, F.R.S., continues indefatigably his most important researches into the colouring matters of plants and animals. Since the publication of his paper, entitled ,'Vegetable Chromatology" (*Proc. Roy. Soc.*, 1873), he has amassed a considerable amount of new material Mr. Sorby has now greatly improved his methods of defining and isolating the various coloured substances which are usually mixed in the coloured substances of both plants and animals. The detached bands of absorption, produced when colouring matters are submitted to the spectroscope (Mr. Sorby always uses it in connexion with the microscope), are sufficiently definite to *characterize* absolutely a whole series of various coloured substances. Mr. Sorby separates these from one another, as explained in his earlier papers, by the bleaching action of sulphites, or by slight oxidation, or by taking advantage of their solubility in ether, alcohol, bisulphide of carbon, or water; or again he makes use of the decomposing action of direct sun-light, which destroys some coloured substances and not others, or, and this he has not as yet published, he makes use of heating to a temperature of 60° C., at which point some substances, such as certain coloured bodies contributing to the tints of sea-weeds, are destroyed.

Mr. Sorby is expected to publish during the ensuing year a series of papers on physiological questions connected with the spectroscopic investigation of coloured organic products, in the pages of the "Quarterly Journal of Microscopical Science."—Abridged from the *Athenæum*.

MR. BRAMWELL ON THE EXPEDIENCY OF THE PATENT LAWS.

At the third ordinary meeting of the Society of Arts, under the presidency of Mr. Fitzjames Stephen, Q.C., Mr. F. J. Bramwell, C.E., F.R.S., read a paper on the expediecy of giving efficient protection by means of patent laws to inventors. The reader having, in the exordium, dwelt on the importance of this subject and the difficulty of dealing with it in a satisfactory manner, proceeded to allude to the economic expediency of giving inventors a property in their works. The economist, he knew, denied the existence of such a thing as right, but of the expediency of protecting inventors there could hardly be a doubt, else what would have become of such cases as those of a Cartwright, a Crompton, or a Bessemer? To mechanical inventors we were indebted for the best forms of everything innate, and everything we used for the comfort of our bodies, and if we turned to our minds we found paper, pens, type, electrotype, steam printing, and the electric telegraphs, all aids to the clear and rapid expression and diffusion of thought. In war also invention played a most important, if a dubiously beneficial, part. Having discussed the arguments against a patent law, Mr. Bramwell expressed his approval of that form of protection, and deprecated any attempt to secure the object by means of secrecy, which always offered a temptation to corruption on the part of workmen. Great Britain, France, and the United States had patent laws, whilst Holland and Switzerland had none—he need not say in which countries inventions most flourished. A good patent law brought in foreign inventions and also good workmen—Dr. Siemens, for example, being now a naturalised Englishman and employing thousands of English workmen. A recapitulation of the arguments for and against the patent laws followed, and the reading concluded with the proposition that, as long as they allowed copyright to exist, mechanical inventions must be protected by an efficient patent law. A discussion followed the reading of the paper, in the course of which Sir A Brady warmly thanked Mr. Bramwell for his able defence of the patent laws, and suggested one or two points in which the existing laws might be improved. Major Hodgkiss, an American gentleman, deemed Mr. Bramwell's arguments to be unanswerable; and, one or two other speakers having followed, the discussion was adjourned.

DEATH OF MR. WATTS PHILLIPS.

Dramatic literature has sustained a loss by the death of Mr. Watts Phillips, who expired on Wednesday morning after a long illness, which had for some time compelled him to throw aside the pen. Born in London towards the close of 1829, Mr. Watts Phillips, at an early age, showed so much aptitude as an artist that Mr. George Cruikshank accepted him as his only pupil, and he pursued his artistic studies at Paris for several years. Ultimately the success of his first play, called "Joseph Chavigny," produced at the Adelphi in May, 1856, induced him to devote himself to authorship. The great impression on the public made by his drama of "The Dead Heart" caused Mr. Benjamin Webster to secure his services specially for the Adelphi; but eventually other establishments were furnished by the now popular dramatist with some of their most attractive novelties. To the Olympic he contributed the drama of "Camilla's Husband," to the Princess's "Paul's Return" and "The Huguenot Captain," to the Haymarket the burlesque drama of "The Woman in Mauve," and to the Surrey the five-act play of "Theodora" and "Nobody's Child." The drama of "Lost in London," originally brought out at the Adelphi, and now being represented at the Princess's Theatre, has kept his name fresh in the memory of the playgoer. Mr. Watts Phillips was also known as a novelist and a frequent contributor to several periodicals.

APPLICATIONS FOR LETTERS PATENT.

Continued from page 2.

On October 23rd.—3648 to 3663.—A. Rigg. Governors and slide valves.—W. Morgan-Brown. Weft stop mechanism for looms (com.)—A. Gutersohn. Disinfecting and medicated paper.—W. Strang. Weaving.—C. E. Fryer Preserving pilchards and other fish.—C. E Fryer. Preserving pilchards and other fish.—W. Ellis and E. Taylor. Umbrella furniture.—L. A. Aspinwall. Construction of potato diggers.—L. Mégy, J. de Echeverria, and F. Bazin. Regulator of the speed of machines.—F. Jones. Improvements in locks for railway carriage and other doors.—T. Parker and P. A. Weston. Direct-acting pumps worked by steam, compressed air, or water, which may also be applied to motive-power engines worked by steam, compressed air, or water.—J. H. Aldridge. Mounting and working gates.—H. A. Bonneville. Woollen fabric, and the preparing and manufacturing of the same (com.)—W. D. Hooker and S. G. Browne. Steam engines and steam regulators attached thereto, also pumps and pump valves worked by said engine.—W. R. Lake. Machinery for nailing boxes (com.)—J. Muirhead. Electric telegraphs.

On October 24th.—3664 to 3681.—J. E. Bennett. Manufacture of sheet-metal match boxes.—T. A. Freeston, G. Ellinor, and J. Harrison. Manufacture of iron and steel.—J. Harcourt. Construction and manufacture of bottle stoppers for various purposes, as also the parts connected with the same.—J. Livesey. Permanent way of railways and tramways.—R. H. Steegmann and E. B. Steegmann.—T. Hall. Money receiving and checking apparatus.—R. Chamberlain and T. Wagstaff. Apparatus for forming loops or eyelets upon wire.—T. Watson. Production of velvets and other similar fabrics.—T. Greenacre. Apparatus for manufacturing screws of vulcanite or other analogous material for liquid meters.—J. C. Brockbank. Method and apparatus for crossing eff pawnbrokers' tickets, the said apparatus being also applicable for marking dates, numbers, or names generally.—F. Ripley and C. C. Seton. Machinery for spinning and doubling fibres.—A. Littlewood. Machinery or apparatus for drawing wire.—A. Chambers. Ventilating underground railways.—A. M. Clark. Link motion for steam engines (com.) (Complete specification.)—A. M. Clark. Railroad carriage axle-boxes (com.) (Complete specification.)—D. Cutler. Solitaires, sleeve links, studs, and other fastenings for articles of dress and jewellery.—T. Brazenor. Shoes for horses and other animals.—M. Wilson. Mode of and apparatus for disinfecting and deodorizing the air in rooms and other places.

On October 26th.—3682 to 3702.—G. Haseltine. Rotary engines (com.)—F. Bloomer. Fire grates of steam boiler and other furnaces.—J. Pickard. Looms.—R. Laycock. Shuttles of looms.—G. L. Scott and I. A. Timmis. Apparatus for heating, drying, and cooking.—S. Holman. Apparatus used in the manufacture of gas.—R. W. Stewart. Shaking linen and other yarns, and the machinery or apparatus employed therefor — P. Purdie. Budds and sprigs, and improvements in the means or mechanism employed for manufacturing the same.—W. Tice. Mode of and apparatus for warming the interiors of railway carriages, steam vessels, and other moving or travelling structures.—W. M. Cranston. Methods of fitting moveable seat supports on or to reaping machines.—E. Foden. Improvements applicable to steam boilers.—G. Brown. Apparatus for preventing collisions on railways.—E. Bazin. Dredging boats. (Complete specification.)—J. Clark. Apparatus for displaying advertisements.—G. Burge and J. Hall. Machinery for breaking stones, cement, clinkers, or other hard substances.—W. R. Lake. Musical boxes (com.)—M. A. de Souza. Counting apparatus.—F. H. Hambleton. Apparatus to admit of the continuous running of a pump, or other apparatus supplying fluid through pipes when the flow through the pipe is for a time wholly or in part arrested, without injury to the pipes and without waste of fluid (com.)—M. A. de Souza. Apparatus for cutting tobacco.—H. Footner. Apparatus for the prevention of accidents upon railway inclines and other parts of railways.—M. A. de Souza. Bread-making machinery.

On October 27th.—3703 to 3719.—L. A. Aspinwall. Implement for planting potatoes.—T. Leeming and R. Ray. Machinery for bronzing, colouring, or otherwise ornamenting paper and other materials.—E. A. Cowper. Preparation of materials for the manufacture of paper, and apparatus therefor.—S. H. Sutton. Fastenings for wearing apparel.—E. Hely. Printing and embossing machines.—J. H. Johnson. Machinery or apparatus employed in the production of paper pulp (com.)—J. Dore. Railway carriage lamps.—T. Perkins. Apparatus to be used in lifting or handling sacks.—G. Wood. Drying lumber and other articles and materials. (Complete specification.)—W. R. Lake. Apparatus for regulating the draft of locomotive engines, and for preventing waste of fuel in same (com.)—A. M. Clark Paper-bag making machinery (com.)—J. Slater. Machinery for making casks.—P. Lombardon. Manufacture of soap.—W. E. Newton. Construction of magazines for containing or storing gunpowder or other explosive or inflammable substances (com.)—J. A. Chandor. Ignition fuses, and means for igniting the same, applicable to lamps, gas burners, cigar lighters, torches, and other like purposes (com.)—O. P. Flynt. Ladies' garments.—F. A. Paget. Centrifugal pumps for raising and forcing liquids, and in centrifugal pumps or fans for exhausting and blowing gases (com.)

On October 28th.—3720 to 3731.—W. Pollard and J. B. Carter. Method of and apparatus for regulating the pressure and supply of fluids and gases.—W. N. Smith. Apparatus for composing type.—G. Whyte. Railway signals and apparatus to be used therefor.—L. A. Aspinwall. Washing machine, and a novel mode and mechanism for actuating the same, the said mechanism being also applicable to other machinery.—W. E. Gedge. Manufacture of plates, slabs, or tiles, in imitation of the ware known as Faïence Parisienne (com.)—W. T. Mann. Presses for compressing cotton, jute, and other materials (com.)—W. R. Lake. Machine for trimming or burnishing the edge of boot and shoe soles and heels (com.)—V. Milward. Needle wrappers or needle cases.—C. Kingsford. Machinery for compressing various substances, especially applicable to the compression of small coal and such like materials.—W. R. Lake. Governor for steam engines (com.)—P. C. Evans. Apparatus for feeding wool, cotton, or other fibrous materials to scribbling, carding, or other machines.—T. S. Cressey. Treating malt.

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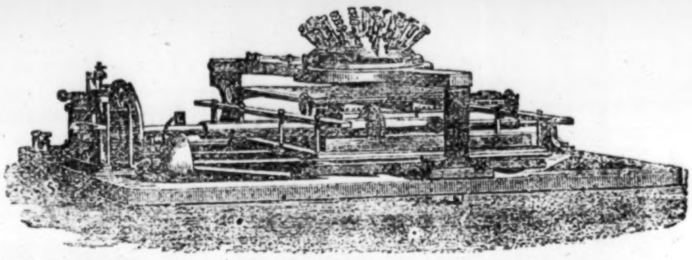

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